WHAT IS CLAIMED IS:

1. An apparatus comprising a circuit which includes:

a first portion having a resonant tunneling device arranged so that, in response to an input signal, said resonant tunneling device causes an electrical signal characteristic to undergo a quantum jump in magnitude from a first value to a second value, said second value being substantially different from said first value, and said quantum jump in magnitude from said first value to said second value taking an interval of time; and

a second portion having a differentiator which responds to said quantum jump of said electrical signal characteristic from said first value to said second value by producing a narrow pulse having a duration which is approximately equal to said interval of time.

2. An apparatus according to Claim 1, wherein said resonant tunneling device is a resonant tunneling diode, and said electrical signal characteristic is a voltage across said resonant tunneling diode.

3. An apparatus according to Claim 2, wherein said differentiator includes first and second capacitors which each have first and second ends, said first end of each said capacitor being coupled to a respective end of said resonant tunneling diode.

4. An apparatus according to Claim 2, wherein said first portion includes:

first and second resistors which each have a first end coupled to a respective end of said resonant tunneling diode, and a second end coupled to ground; and

first and second capacitors which each have a first end coupled to a respective end of said resonant tunneling diode, and a second end coupled to ground.

5. An apparatus according to Claim 2, wherein said first portion includes a transformer having an input coil responsive to said input signal, and having an output coil with first and second ends which are each coupled to a respective end of said resonant tunneling diode.

6. An apparatus according to Claim 2,

wherein said resonant tunneling diode has first and second ends, said first end of said resonant tunneling diode being coupled to a first bias voltage; and

wherein said first portion includes:

a resistor having first and second ends, said second end of said resistor being coupled to a second bias voltage less than said first bias voltage; and

a transistor having two terminals respectively coupled to said second end of said resonant tunneling diode and said first end of said resistor, and having a control terminal coupled to said input signal.

7. An apparatus according to Claim 2,

wherein said resonant tunneling diode has first and second ends, said second end of said resonant tunneling diode being coupled to ground; and

wherein said first portion includes:

a resistor having first and second ends, said second end of said resistor being coupled to said first end of said resonant tunneling diode;

a transistor having a first terminal coupled to a first bias voltage, a second terminal coupled to said first end of said resistor, and a control terminal coupled to said input signal; and

a constant current source having a first end coupled to said second terminal of said transistor, and a second end coupled to a second bias voltage which is less than said first bias voltage.

8. An apparatus according to Claim 7, wherein said constant current source includes a field effect transistor having one of the source and drain thereof coupled to said first end of said resistor and the other of the source and drain thereof coupled to said second bias voltage, and having the gate thereof coupled to said other of said source and drain thereof.

9. An apparatus according to Claim 2,

wherein said resonant tunneling diode is a first resonant tunneling diode and has first and second ends; and

wherein said first portion includes:

a second resonant tunneling diode having first and second ends, said first end of said first resonant tunneling diode being coupled to said second end of said second resonant tunneling diode;

a reference current source coupled to said first end of said first resonant tunneling diode;

a first resistor having a first end coupled to said first end of said second resonant tunneling diode, and a second end coupled to said input signal; and

a second resistor having a first end coupled to said second end of said first resonant tunneling diode and a second end coupled to an inverse of said input signal.

10. An apparatus comprising a circuit which includes:

a first portion having a resonant tunneling device arranged so that, in response to an input signal, said resonant tunneling device causes an electrical characteristic to undergo a quantum jump in magnitude from a first value to a second value, said second value being substantially different from said first value, and said quantum jump in magnitude from said first value to said second value taking an interval of time; and

a second portion having a sampling portion with a sampling input for receiving a signal to be sampled, said sampling portion responding to said quantum jump in magnitude of said electrical signal characteristic from said first value to said second value by causing said sampling portion to sample a signal at said sampling input during a time period which is approximately equal in duration to said interval of time.

11. An apparatus according to Claim 10, wherein said second portion includes a differentiator which responds to said quantum jump of said electrical signal characteristic from said first value to said second value by producing a narrow pulse having a duration which is approximately equal to said interval of time, said sampling portion effecting said sampling in response to and during said narrow pulse from said differentiator.

12. An apparatus according to Claim 10, wherein said resonant tunneling device is a resonant tunneling diode, and said electrical signal characteristic is a voltage across said resonant tunneling diode.

13. An apparatus according to Claim 12, wherein said first portion includes:

first and second resistors which each have a first end coupled to a respective end of said resonant tunneling diode, and a second end coupled to ground; and

first and second capacitors which each have a first end coupled to a respective end of said resonant tunneling diode, and a second end coupled to ground.

14. An apparatus according to Claim 12, wherein said first portion includes a transformer having an input coil responsive to said input signal, and having an output coil with first and second ends which are each coupled to a respective end of said resonant tunneling diode.

15. An apparatus according to Claim 12,

wherein said resonant tunneling diode has first and second ends, said first end of said resonant tunneling diode being coupled to a first bias voltage; and

wherein said first portion includes:

a resistor having first and second ends, said second end of said resistor being coupled to a second bias voltage less than said first bias voltage; and

a transistor having two terminals respectively coupled to said second end of said resonant tunneling diode and said first end of said resistor, and having a control terminal coupled to said input signal.

16. An apparatus according to Claim 12,

wherein said resonant tunneling diode has first and second ends, said second end of said resonant tunneling diode being coupled to ground; and

wherein said first portion includes:

a resistor having first and second ends, said second end of said resistor being coupled to said first end of said resonant tunneling diode;

a transistor having a first terminal coupled to a first bias voltage, a second terminal coupled to said first end of said resistor, and a control terminal coupled to said input signal; and

a constant current source having a first end coupled to said second terminal of said transistor, and a second end coupled to a second bias voltage which is less than said first bias voltage.

17. An apparatus according to Claim 16, wherein said constant current source includes a field effect transistor having one of the source and drain thereof coupled to said first end of said resistor and the other of the source and drain thereof coupled to said second bias voltage, and having the gate thereof coupled to said other of said source and drain thereof.

18. An apparatus according to Claim 12,

wherein said resonant tunneling diode is a first resonant tunneling diode and has first and second ends; and

wherein said first portion includes:

a second resonant tunneling diode having first and second ends, said first end of said first resonant tunneling diode being coupled to said second end of said second resonant tunneling diode;

a reference current source coupled to said first end of said first resonant tunneling diode;

a first resistor having a first end coupled to said first end of said second resonant tunneling diode, and a second end coupled to said input signal; and

a second resistor having a first end coupled to said second end of said first resonant tunneling diode and a second end coupled to an inverse of said input signal.

19. A method comprising:

providing a circuit having a first portion which includes a resonant tunneling device, and a second portion which includes a differentiator;

applying to said first portion an input signal;

causing said resonant tunneling device to respond to said input signal by effecting a quantum jump in magnitude of an electrical signal characteristic from a first value to a second value, said second value being substantially different from said first value, and said quantum jump in magnitude from said first value to said second value taking an interval of time; and

causing said differentiator to respond to said quantum jump of said electrical signal characteristic from said first value to said second value by producing a narrow pulse having a duration which is approximately equal to said interval of time.

20. A method according to Claim 19, including selecting as said resonant tunneling device a resonant tunneling diode, said electrical signal characteristic being a voltage across said resonant tunneling diode.

21. A method according to Claim 20, including configuring said differentiator to have first and second capacitors which each have first and second ends, said first end of each said capacitor being coupled to a respective end of said resonant tunneling diode.

22. A method comprising:

providing a circuit having a first portion which includes a resonant tunneling device, and a second portion which includes a sampling portion with a sampling input;

applying to said first portion an input signal;

applying to said sampling input a signal to be sampled;

causing said resonant tunneling device to respond to said input signal by effecting a quantum jump in magnitude of an electrical signal characteristic from a first value to a second value, said second value being substantially different from said first value, and said quantum jump in magnitude from said first value to said second value taking an interval of time; and

causing said sampling portion to respond to said quantum jump in magnitude of said electrical signal characteristic from said first value to said second value by sampling the signal at said sampling input during a time period which is approximately equal in duration to said interval of time.

23. A method according to Claim 22, including:

configuring said second portion to include a differentiator;

causing said differentiator to respond to said quantum jump of said electrical signal characteristic from said first value to said second value by producing a narrow pulse having a duration which is approximately equal to said interval of time; and

causing said sampling portion to effect said sampling in response to and during said narrow pulse from said differentiator.

24. A method according to Claim 22, including selecting as said resonant tunneling device a resonant tunneling diode, said electrical signal characteristic being a voltage across said resonant tunneling diode.